Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-55 (Canceled)

56. (New) A device which is used in an optical network system for transferring a user packet, which is input to said optical network system from outside said optical network system, to outside said optical network system through a plurality of said devices, which are sequentially provided from an upstream side to a downstream side of a transfer route, the device comprising:

a router;

an optical switch; and

a node control device,

wherein said node control device may function as a transmission side edge node device, a core node device, and a destination side edge node device,

said node control device comprising:

an optical path allocation request packet processing means for

(1) transferring a first open resource information of said destination side edge node device as an optical path allocation request packet to said transmission side edge node device through said core node device on the upstream side of the transfer route, when said node device functions as said destination edge node device, and

(2) adding a second open resource information of said core node device to said optical path allocation request packet received from said destination side edge device on the downstream side of the transfer route and transferring it to another node control device on the upstream side of the transfer route, when said node control device functions as said core node device;

an optical path allocation packet processing means for

(b1) selecting open resource information capable of determining the allocation of an optical path, which can pass through said core node device without going through the router therein, based on said first and second open resource information received from said core node device on the downstream side of the transfer route, when said node device functions as said transmission side edge node device, and

(b2) notifying the allocation of the optical path to said core node device relating to the selected open resource information, using an optical path allocation packet; and

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an optical path switching means for

(c1) controlling said optical switch according to said optical path allocation packet to set said optical path which does not go through said router, when said node device control functions as said core node device, and

(c2) outputting an optical path setting completion notice packet to notify of completion of the optical path setting to said transmission side edge node device.

57. A node device which is used in an optical network system for transferring a user packet, which is input to said optical network system from outside said optical network system, to outside said optical network system through a plurality of said node devices, which are sequentially provided from an upstream side of a transfer route to a downstream side thereof and which function as a transmission side edge node device, a core node device and a destination side edge node device, respectively, the node device comprising:

a router;

an optical switch; and

a node control device that may function as one of said transmission side edge node device, said core node device, and said destination side edge node device, said node control device comprising;

(1) an optical path allocation request packet processing means for

(a1) transferring a first open resource information of said node control device as an optical path allocation request packet to said destination side edge node device through said core node device on the downstream side of the transfer route, when said node control device functions as said transmission edge node device, and

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(a2) adding a second open resource information of said control node device to said optical path allocation request packet received from said transmission side edge device on the upstream side of the transfer route and transferring it to another node control device on the downstream side of the transfer route when said node device functions as said core node control device;

(2) an optical path allocation packet processing means for

(b1) selecting open resource information capable of determining the allocation of an optical path, which can pass through said core node device without going through the router therein, based on said first and second open resource information received from said core node device on the upstream side of the transfer route, when said node control device functions as said destination side edge node device, and

(b2) notifying the allocation of the optical path to said core node device relating to the selected open resource information, using an optical path allocation packet; and

(3) an optical path switching means for

(c1) controlling said optical switch according to the notified optical path allocation packet to set said optical path which does not go through said router, when said node control device functions as said core node device, and

(c2) outputting an optical path setting completion notice packet to notify the completion of the optical path setting to said transmission side edge node device.

58. A node device which is used in an optical network system for transferring a user packet, which is input to said optical network system from outside said optical network system, to outside said optical network system through a plurality of said node devices, which are sequentially provided from an upstream side to a downstream side of a transfer route and which function as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, the node device comprising:

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a router;

an optical switch; and

a node control device that may function as one of said transmission side edge node device, said core node device, and said destination side edge node device, said node control device comprising:

(1) an optical path allocation packet processing means for

(a1) transferring a first open resource information of said node control device as an optical path allocation packet to said transmission side edge node device through said core node device on the upstream side of the transfer route, when said node control device functions as said destination edge node device, and

(a2) determining a possibility of setting an optical path in said core node device relating to said first open resource information presented in said optical path allocation packet received from said destination side edge node device on the downstream side of the transfer route, when said node control device functions as said core node device, thereby

(a2-1) adding an optical path set table information to said optical path allocation packet and transferring it with the added set table information to another node device on the upstream side of the transfer route if an optical path setting is possible, or

(a2-2) adding a second open resource information of said core node device itself to said optical path allocation packet and transferring it with the added second open resource information to said another node device if an optical path setting is impossible; and

(2) an optical path switching means for

(c1) controlling said optical switch according to the determination of the possibility of the optical path setting by said optical path allocation packet processing means to set, if the optical path setting is possible, said optical path which does not go through said router in said core node device relating to said first open resource information.

59. A node device which is used in an optical network system for transferring a user packet, which is input to said optical network system from outside said optical network system, to outside said optical network system through a plurality of said node devices, which are sequentially provided from an upstream side to a downstream side of a transfer route and which function as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, the node device comprising:

a router;

an optical switch; and

a node control device that may function as one of said transmission side edge node device, said core node device, and said destination side edge node device, said node device comprising;

(1) an optical path allocation packet processing means for

(a1) transferring a first open resource information of said node control device as an optical path allocation packet to said destination side edge node device through said core node device on the downstream side of the transfer route, when said node control device functions as said transmission edge node device, and

(a2) determining the possibility of setting an optical path in said core node device relating to said first open resource information presented in said optical path allocation packet received from said transmission side edge node device on the upstream side of the transfer route when said node control device functions as said core node device, thereby

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(a2-1) if an optical path setting is possible, adding an optical path set table information to said optical path allocation packet and transferring it with the added set table information to another node control device on the downstream side of the transfer route, or

(a2-2) if an optical path setting is impossible, adding a second open resource information of said core node device itself to said optical path allocation packet and transferring it with the added second open resource information to said another node control device; and

(2) an optical path switching means for

(c1) controlling said optical switch according to the determination of the possibility of the optical path setting by said optical path allocation packet processing means to set, if the optical path setting is possible, said optical path which does not go through said router in said core node device relating to said first open resource information.

60. The node device according to Claim 56, wherein said node control device further comprises:

a forced releasing means for forcibly releasing the optical path when a predetermined time has elapsed since setting of the optical path or when a decrease in a number of communication packets is confirmed at the node device positioned at both ends of said optical path.

61. The node device according to Claim 56, wherein said node control device further comprises:

an optical path determination means for determining the necessity of the setting of the optical path before transmitting the optical path allocation request packet or transmitting the optical path allocation packet, and selectively setting the optical path only when necessary.

62. The node device according to Claim 56, wherein said node control device further comprises:

an information channel insuring means for determining whether an information channel is continuously insured after setting the optical path between the node devices on the transfer route where the optical path is set before transmitting the optical path allocation request packet or transmitting the optical path allocation packet, and setting the optical path only when the information channel is insured.

63. The node device according to Claim 56, further comprising:

an optical cross-connect having input ports and output ports for one of extracting optical signals from an optical fiber or inserting optical signals to an optical fiber, and relaying optical signals between arbitrary input/output optical fibers for optical path setting; wherein said router receives a transfer packet based on header information and determines the output destination of the transfer packet; and wherein said node control device switches a connected pair of each input port and output port inside said optical

cross-connect according to instructions of the received transfer packet or based on self judgment.

64. The node device according to Claim 63, further comprising a switch to connect a destination-based buffer to at least one of the outputs from said router to said optical cross-connect, and to connect a packet read from said destination-based buffer to at least one of said input ports of said optical cross-connect.

65. The node device according to Claim 64, further comprising:

an allowable delay recognition function means provided in said router for determining an allowable delay of said user packet, so that only user packets having a large allowable delay are allowed to be output to said destination-based buffer and user packets having a small allowable delay are directly output to said optical cross-connect.

66. The node device according to Claim 63, further comprising:

an optical path extraction/insertion means provided in said optical cross-connect for an information channel for extracting optical signals with a fixed wavelength insured for the information channel from the optical fiber, or for inserting said optical signals with a fixed wavelength into the optical fiber, for communicating information signals with another node device.

67. The node device according to Claim 63, further comprising:

a pilot tone signal transmission means provided in said optical cross-connect for an information channel for overlaying pilot tone signals for the information channel on an optical path for user data or separating pilot tone signals for the information channel from the optical path for user data for communication of information signals with another node device.

68. An optical path setting method for an optical network system for transferring a user packet, which is input from outside said optical network system, to outside said optical network system through a plurality of node devices, which are sequentially provided from an upstream side to a downstream side of a transfer route and which function as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, each of said node devices comprising a router, an optical switch, and a node control device, and said node control device including an optical path allocation request packet processing means, an optical path allocation packet processing means, and an optical path switching means and being capable of functioning as one of said transmission side edge node device, said core node device, and said destination side edge node device, the method comprising the steps of:

(1) transferring a first open resource information of said node device functioning as said destination side edge node device said as an optical path allocation request packet to said transmission side edge node device through said core node device on the upstream side of the transfer route under the control of said optical path allocation request packet processing means;

(2) adding a second open resource information of said node device functioning as said core node device to said optical path allocation request packet received from said destination side edge device on the downstream side of the transfer route and transferring the first and second open resource information to another node device on the upstream side of the transfer route under the control of said optical path allocation request processing means in said core node device;

(3) selecting open resource information capable of determining the allocation of an optical path, which can pass through said core node device without going through the router therein, based on said first and second open resource information received from said core node device on the downstream side of the transfer route with said transmission

side edge node device, under the control of said optical allocation packet processing means in said core node device;

(4) notifying the allocation of the optical path to said core node device relating to the selected open resource information, using an optical path allocation packet, with said transmission side edge node device, under the control of said optical allocation said core node device;

(5) controlling said optical switch according to the notified optical path allocation packet to set said optical path which does not go through said router with said core node device, under the control of said optical path switching means in said core node device, and

(6) outputting an optical path setting completion notice packet to notify the completion of the optical path setting to said transmission side edge node device with said core node device, under the control of said optical path switching means in said core node device.

69. An optical path setting method for an optical network system for transferring a user packet, which is input from outside said optical network system, to outside said optical network system through a plurality of node devices, which are sequentially provided from an upstream side to a downstream side of a transfer route and which function as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, each of said node devices comprising a router, an optical switch, and a node control device, and said node control device including an optical path allocation request packet processing means, an optical path allocation packet processing means, and an optical path switching means and being capable of functioning as one of said transmission side edge node device, said core node device, and said destination side edge node device, the method comprising the steps of:

(1) transferring a first open resource information of said transmission side edge node device as an optical path allocation request packet to said side destination edge node device through said core node device on the downstream side of the transfer route with said transmission side edge node device, under the control of said optical path allocation request packet processing means in said transmission side edge node device;

(2) adding a second open resource information of said core node device to said optical path allocation request packet received from said transmission side edge node device to the upstream side of the transfer route and transferring the first and second open resource information to another node device on the downstream side of the transfer route with said core node device, under the control of said optical path allocation request processing means in said core node device;

(3) selecting open resource information capable of determining the allocation of an optical path, which can pass through said core node device without going through the router therein, based on said first and second open resource information received from said core node device on the upstream side of the transfer route with said destination side edge node device, under the control of said optical path allocation packet processing means in said destination side edge node device;

(4) notifying the allocation of the optical path to said core node device relating to the selected open resource information, using an optical path allocation packet with said destination side edge node device, under the control of said optical path allocation packet processing means in said destination side edge node device;

(5) controlling said optical switch according to the notified optical path allocation packet to set said optical path which does not go through said router when said node device functions as said core node device with said destination side edge node device, under the control of said optical path switching means in said core node device; and

(6) outputting an optical path setting completion notice packet to notify the completion of the optical path setting to said transmission side edge node device with said destination side edge node device, under the control of said optical path switching means in said core node device.

70. An optical path setting method for an optical network system for transferring a user packet, which is input from outside said optical network system, to outside said optical network system through a plurality of said node devices, which are sequeutially provided from an upstream side to a downstream side of a transfer route and which functions as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, each of said node devices comprising a router, an optical switch, and a node control device, and said node control device including an optical path allocation packet processing means, and an optical path switching means and being capable of functioning as one of said transmission side edge node device, said core node device, and said destination side edge node device, the method comprising the steps of:

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(1) transferring a first open resource information of said destination side edge node device as an optical path allocation packet to said transmission side edge node device through said core node device on the upstream side of the transfer route with said destination side edge node device, under the control of said optical path allocation packet processing means in said destination side edge node device, and

(2) determining the possibility of setting an optical path in said core node device relating to said first open resource information presented in said optical path allocation packet received from said destination side edge node device on the downstream side of the transfer route with said core node device, under the control of said optical path allocation packet processing means in said core node device, thereby

(a1) adding an optical path set table information to said optical path allocation packet and transferring it with the added set table information to another node device on the upstream side of the transfer route if an optical path setting is possible, or

(a2) adding a second open resource information of said core node device to said optical path allocation packet and transferring it with the added second open resource information to said another node device if an optical path setting is impossible.

71. An optical path setting method for an optical network system for transferring a user packet, which is input from outside said optical network system, to outside said optical network system through a plurality of said node devices, which are sequentially provided from an upstream side to a downstream side of a transfer route and which function as a transmission side edge node device, a core node device, and a destination side edge node device, respectively, each of said node devices comprising a router, an optical switch, and a node control device; and said node control device including an optical path allocation packet processing means and being capable of functioning as one of said transmission side edge node device, said core node device, and said destination side edge node device, the method comprising the steps of:

(1) transferring a first open resource information of said transmission side edge node device as an optical path allocation packet to said destination side edge node device through said core node device on the upstream side of the transfer route with said transmission side edge node device, under the control of said optical path allocation packet processing means in said transmission side edge node, and

(2) determining the possibility of setting an optical path in said core node device relating to said first open resource information presented in said optical path allocation packet received from said transmission side edge node device on the upstream

side of the transfer route with said core node device, under the control of said optical path allocation packet processing means, thereby

(a1) adding an optical path set table information to said optical path allocation packet and transferring it with the added set table information to another node device on the downstream side of the transfer route if an optical path setting is possible, or

(a2) adding a second open resource information of said core node device itself to said optical path allocation packet and transferring it with the added second open resource information to said another node device if an optical path setting is possible.

72. An optical path setting method according to Claim 68, further comprising forcibly releasing the optical path when a predetermined time has elapsed since the setting of the optical path, or when a decrease in a number of communication packets is confirmed at a node device positioned at both ends of the optical path.

73. The optical path setting method according to Claim 68, further comprising:

determining whether an information channel is continuously insured after setting the optical path between node devices on the transfer route where the optical path is set before setting the optical path; and

setting the optical path only when the information channel is insured.

74. The optical path setting method according to Claim 68, further comprising:

outputting a user packet read from a destination-based buffer provided between said router and said optical switch.

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75. The optical path setting method according to Claim 68, further comprising:

communicating information between node devices where the optical path is set by using optical signals with a fixed wavelength insured for the information channel after the optical path is set.